

Child Restraint Device Use and Misuse

Final Report



Prepared for:
Office of Highway Safety Planning
4000 Collins Road
Lansing, MI

Prepared by:
Wayne State University
Transportation Research Group
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The opinions, findings, and conclusions expressed in this publication are those of the author(s) and not necessarily those of the Michigan Office of Highway Safety and Planning, the U.S. Department of Transportation, the Federal Highway Administration or the National Highway Transportation Safety Administration. This report was prepared in cooperation with the Michigan Office of Highway Safety Planning, the U.S. Department of Transportation, and the National Highway Traffic Safety Administration.

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1.0 INTRODUCTION

Children who are involved in a traffic crash may suffer severe injuries or even death due to the lack of, or improper use of, child restraint devices (CRD). Children may be exposed to a heightened risk of injury when traveling in an automobile for a variety of factors including: improper use of CRDs, improper installation of CRDs as per the manufacturers specifications, use of inappropriate size of CRDs for the children's age/weight/height, moving children to regular safety belt use too soon, lack of knowledge regarding the potential safety dangers and risks when traveling with children, and others. In spite of many of these factors, CRDs are generally effective; however, they are much more effective when properly installed and used.

Traffic crashes are responsible for the death of many children of ages up to 4 years old and is a leading cause of death among children between the ages of 1 and 4. In Michigan, there are approximately 672,000 children up to the age of 4 years. Out of this population of 672,000, 1,570 children were involved in traffic crashes resulting in injuries or fatalities in the year 2002. In order to alleviate children being injured or killed, a law was passed in Michigan in 1982 making CRD use mandatory for children up to the age of 3 years.

In order to assess the impact of this law, the Office of Highway Safety Planning (OHSP) funded a statewide survey in 1997 of CRD use and misuse in Michigan. In 1997, researchers at the University of Michigan-Transportation Research Institute (UMTRI) performed an observational survey of children restraint devices use and misuse. The surveys were performed at pediatric medical facilities and day care centers. The results of the survey estimated that 74.5 percent of children up to the age of four years are restrained in safety seats when traveling in a motor vehicle. The use rates were highest when accompanied by a belted female driver. In terms of misuse, improper restraint in some form or other was observed in 88.5 percent of the inspections, which is a very high rate. Misuse generally consisted of snugness of fit and the use of clips.

The LATCH system (Lower Anchors and Tethers for Children) was introduced in vehicles, manufactured after September 1, 2002, to make CRD installation easier by eliminating the need to use safety belts to secure the CRD. Instead, vehicles equipped with the LATCH system have anchors that are built into the left and right rear seat positions of the vehicle to easily secure the

CRDs. Until this study (2005 study), no CRD use/misuse surveys have been conducted since the introduction of the LATCH system and thus, their impact on improving child restraint use and misuse when traveling in motor vehicles were unknown.

1.1 Study Purpose and Objectives

The overall objective of this study is to track the changes in child restraint use and misuse that have occurred since the previous study of 1997, and to assess the impact of the LATCH system on CRD use and misuse. This survey will provide valuable information regarding the changes in the child restraint use in relation to various demographic groups throughout the State of Michigan.

The specific objectives of this study were as follows:

- Develop a methodology for collecting data for a representative sample of sites throughout the state.
- Provide training to all staff conducting the observational and interview surveys.
- Conduct QA/QC (Quality Assurance/Quality Control) of the data collection efforts.
- Conduct an observational survey to determine CRD use in Michigan.
- Conduct interviews and inspections to detect misuse rate of CRDs in Michigan.
- Determine overall rates of CRD use and misuse in Michigan, as well as rates categorized by driver and vehicle characteristics and patterns of misuse.
- Summarize the observational and interview data of CRD use and misuse in a spreadsheet format.
- Assess deficiencies in the CRD misuse rates, with and without the LATCH system introduced in 1999, by comparing the results of the 1997 survey results with the current survey results.

1.2 Study Areas

The study area for the observational survey included the counties that represented at least 85 percent of the population in the State of Michigan, as shown in Table 1 and depicted in Figure 1.

Table 1. U.S. Census Bureau 2003 Census Data for Michigan by County

State of Michigan Total Population = 10,079,985

Name of County	Percent Population Statewide for Michigan		Cumulative Percent Population Statewide for Michigan	County Ranking by Population	County Included in Study
Wayne County	2,028,778	20.13%	20.13%	1	Yes
Oakland County	1,207,869	11.98%	32.11%	2	Yes
Macomb County	813,948	8.07%	40.18%	3	Yes
Kent County	590,417	5.86%	46.04%	4	Yes
Genesee County	442,250	4.39%	50.43%	5	Yes
Washtenaw County	338,562	3.36%	53.79%	6	Yes
Ingham County	282,030	2.80%	56.59%	7	Yes
Ottawa County	249,391	2.47%	59.06%	8	Yes
Kalamazoo County	242,110	2.40%	61.46%	9	Yes
Saginaw County	209,327	2.08%	63.54%	10	Yes
Muskegon County	173,090	1.72%	65.26%	11	Yes
Livingston County	172,881	1.72%	66.97%	12	Yes
Saint Clair County	169,063	1.68%	68.65%	13	Yes
Berrien County	162,766	1.61%	70.26%	14	Yes
Jackson County	162,321	1.61%	71.87%	15	Yes
Monroe County	150,673	1.49%	73.37%	16	Yes
Calhoun County	138,854	1.38%	74.75%	17	Yes
Allegan County	110,331	1.09%	75.84%	18	Yes
Bay County	109,452	1.09%	76.93%	19	Yes
Eaton County	106,197	1.05%	77.98%	20	Yes
Lenawee County	100,786	1.00%	78.98%	21	Yes
Lapeer County	91,314	0.91%	79.89%	22	Yes
Midland County	84,492	0.84%	80.72%	23	Yes
Grand Traverse County	82,011	0.81%	81.54%	24	Yes
Van Buren County	78,210	0.78%	82.31%	25	Yes
Shiawassee County	72,543	0.72%	83.03%	26	Yes
Clinton County	67,609	0.67%	83.70%	27	Yes
Isabella County	64,663	0.64%	84.34%	28	Yes
Marquette County	64,616	0.64%	84.99%	29	Yes
Ionia County	63,573	0.63%	85.62%	30	Yes
Montcalm County	62,926	0.62%	86.24%	31	Yes
Saint Joseph County	62,864	0.62%	86.86%	32	Yes

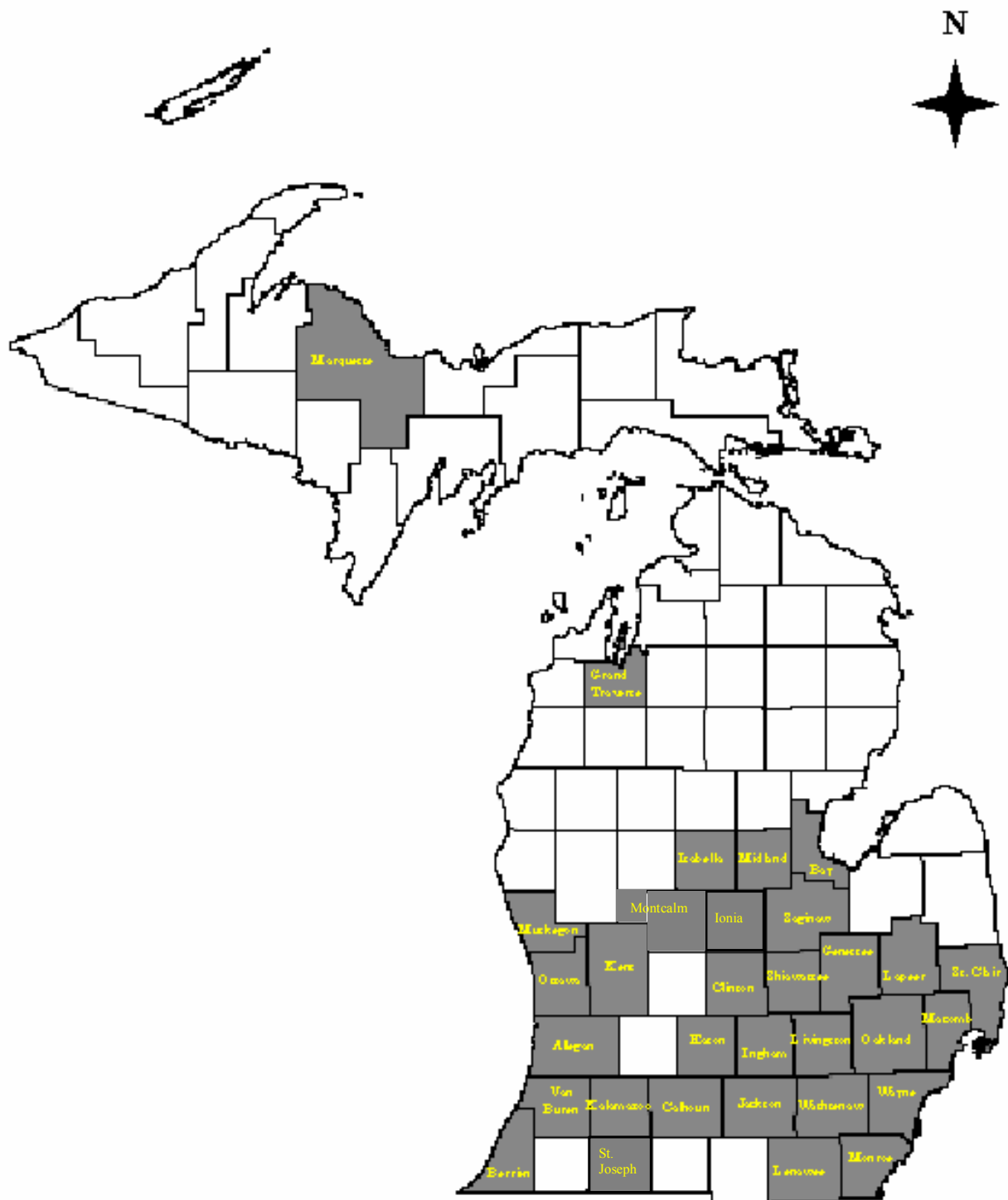


Figure 1. 32 Counties for the Direct Observation CRD Surveys

2.0 METHODOLOGY

2.1 Observational Surveys

The National Highway Traffic Safety Administration (NHTSA) does not require states to conduct child safety restraint observational studies and thus, does not provide any recommended procedure for conducting such surveys. However, NHTSA has published guidelines for conducting safety belt surveys, which were followed for the CRD use/misuse survey. The 32 county sample depicted in Figure 1 represents the top 86.86 percent of the state's population based upon 2003 U.S. Bureau of Census Data estimates.

A system for partitioning the candidate counties into various strata was developed for the 2005 May *Click It or Ticket* project and is shown in Table 2. The number of observations in each stratum, based upon the percentage of total VMT per stratum, is also shown in Table 2. Due to the similarity of the 2005 May *Click It or Ticket* project and the CRD observational survey, CRD use/misuse was performed at the time of the *Click It or Ticket* survey. Therefore, 48 sites were used for the observational survey for Stratum 1, 50 sites for Stratum 2, 53 sites for Stratum 3 and 41 sites for Stratum 4.

Due to the low number of CRD observations during the *Click It or Ticket* project, 80 additional intersections were selected for the CRD observational survey. Eighty sites included 21 intersections in Stratum 1, 21 in Stratum 2, 20 in Stratum 3, and 18 in Stratum 4. A total of 1,560 CRD observations were collected. The additional intersections were selected randomly with one qualification, each selected intersection must have a destination that parents would normally bring their child. These destinations included fast-food restaurants, recreational facilities, shopping centers, grocery stores, day care centers, health care facilities and movie theaters. The sites were then randomly chosen using a method that ensured an equal probability for each location in each stratum being selected as a candidate location. For the selection of the candidate locations, equal scale (3/8 inch = 1 mile) road maps were obtained for each county. A computerized grid was overlaid on each county map at 0.5 mile intervals in the horizontal and vertical directions. Each grid on the county map was assigned two numbers representing an X and Y coordinate. In addition, each grid was assigned a number by stratum. For each stratum, a random number was chosen between one and the number of grids covering the stratum. Then two additional random numbers were selected representing the X and Y coordinates of the

Table 2. Vehicle Miles of Travel by Stratum

	VMТ (2003) (in Thousands)	Total VMТ (in Thousands)	Percent of Total VMТ	Number of Sites
Stratum 1				
Ingham	2,491,976	21,693,020	25.09%	48
Kalamazoo	2,576,843			
Oakland	12,939,326			
Washtenaw	3,684,875			
Total Stratum 1 VMТ				
Stratum 2				
Allegan	1,201,958	22,728,263	26.29%	50
Bay	1,296,046			
Eaton	1,175,317			
Grand Traverse	765,054			
Jackson	1,694,008			
Kent	5,502,289			
Livingston	1,928,120			
Macomb	6,375,133			
Midland	821,019			
Ottawa	1,969,319			
Total Stratum 2 VMТ				
Stratum 3				
Berrien	2,097,589	23,599,102	27.29%	53
Calhoun	1,754,104			
Clinton	1,144,555			
Genesee	4,729,238			
Ionia	687,330			
Isabella	559,488			
Lapeer	882,756			
Lenawee	872,269			
Marquette	610,484			
Monroe	2,081,254			
Montcalm	595,758			
Muskegon	1,402,022			
Saginaw	2,213,129			
Saint Clair	1,630,037			
Saint Joseph	579,779			
Shiawassee	778,020			
Van Buren	981,290			
Total Stratum 3 VMТ				
Stratum 4				
Wayne	18,445,891	18,445,891	21.33%	41
Total Stratum 4 VMТ				
Total Strata VMТ		86,466,276		

selected grid. Random coordinates were chosen until an intersection located in the grid coordinates was found. This process was repeated until the additional 80 intersections were selected. For each selected intersection, available destinations were determined within a five mile radius. If a selected intersection did not have an available destination within a five mile radius, a secondary intersection was selected following the same procedure. Upon the determination of the sites, the direction of traffic flow, the day of the week and time of day at each observation site was determined through a similar random method ensuring equal probability. For each intersection randomly selected, the direction of traffic flow for observation was chosen. Random numbers between one and four were selected for each primary and secondary intersection. The selected random numbers represented one for eastbound, two for southbound, three for westbound and four for northbound. This process selected the direction of traffic flow as well as the roadway for observation. Only vehicles having passengers under the age of four were observed at each site with a target of 20 vehicles.

In order to minimize the travel time and distance required to conduct this study, the observation sites were clustered into geographic regions upon final selection without compromising the randomness of the data. The list of intersections with vehicles carrying children under the age of four is shown in Table 3.

Table 3. Observed Intersections by Stratum

Stratum, Name of County	Intersection
Stratum 1	
Ingham County	Abbott and Burcham
	Cavanaugh and Pennsylvania
	Grand River and Putnam
	Saginaw and Canal
	Saginaw and Marketplace
	US-127 and M-36
Oakland County	10 Mile and Meadowbrook
	14 Mile and Main
	Airport and Hatchery
	I-696 and Orchard Lake
	Northwestern and Middlebelt

	Northwestern and Winoma
	Telegraph and 12 Mile
	Walton and Joslyn
	Walton and Lapeer
	Walton and Livernois
Washtenaw County	8 Mile and US-23
	Geddes and Earhart
	I-94 and Huron
	I-94 and Jackson
	Maple and Miller
Stratum 2	
Allegan County	US-131 and M-89
Bay County	Adams and 10 th
	I-75 and Pinconning
	Washington and McKinley
Jackson County	Parnal and Lansing
	Wildwood and Lawrence
Kent County	Ada and Bronson
	Jefferson and Griswold
	US-131 and 84 th
Livingston County	Hamburg and M-36
	I-96 and Kensington
	Spencer and Grand River
Macomb County	14 Mile and Ryan
	21 Mile and Gratiot
	23 Mile and Van Dyke
	M-34 and M-53
	Jefferson and Hooker
	Jefferson and Martin
Midland County	M-20 and Chippewa River
	Wheeler and Swede
Ottawa County	Lake Michigan and 52 nd
Stratum 3	
Berrien County	East Michigan and Wood
Calhoun County	Dickman and Skyline
	I-94 and I-194

	Van Buren and Washington
Genesee County	Bristol and I-475
	Flushing and Eldorado
	Saginaw and Maple
Lapeer County	Genesee and Main
	Genesee and Remington
	M-24 and Daly
Lenawee County	Main and US-223
	Maumee & McVicar
Monroe County	Nadeau and Dixie Hwy.
	Sterns and Douglas
Muskegon County	Main and Heights Ravenna
	Marquette and Creston
Saginaw County	Bay and Shattock
	Center and Brockway
	Janes and Outer Drive
Van Buren County	I-196 and Phoenix
Stratum 4 (Wayne County)	
	7 Mile and Van Dyke
	8 Mile and M-10
	Canton Center and Geddes
	Ecorse and Haggerty
	Ecorse and Monroe
	Eureka and Middlebelt
	Eureka and Telegraph
	I-96 and Livernois
	I-75 and M-39
	Joy and Middlebelt
	Lilley and Palmer
	Michigan and Ford
	Michigan and Greenfield
	Northline and Telegraph
	Plymouth and Farmington
	Plymouth and Greenfield
	Van Dyke and McNichols
	Woodward and Warren

2.2 Interview Surveys

The methodology from the 1997 survey was used as a guide in determining the scope and methodology for the proposed interview survey. The WSU-TRG methodology has two main differences as compared to the 1997 survey, which include: 1) using a larger number of sites in the sample and 2) selecting the type of sites in which the surveys will be conducted.

In the previous 1997 study, the locations where the CRD use and misuse surveys were conducted were limited to pediatric centers and childcare centers, which may have produced biased results. Four studies performed by NHTSA in the 1980s were led by Dr. Tapan Datta. In these studies, safety belt and child safety seat usage surveys were observed at various locations throughout the US (DTNH-22-84-C-07264, DTNH-22-82-C-07126, DTNH-22-87-C-07081 and DTNH-22-89-C-07034). Specifically, in one of these studies, observation surveys were conducted at intersections and shopping centers and fast-food restaurants in 19 cities across the United States. It was found that when traveling to a childcare center or to a doctor's office when the child is ill, parents tend to take more precautions for their children's safety. Therefore, the child is more than likely to be restrained correctly during such trips. However, during recreational or particularly short trips where risk is assumed to be less, parents tend to be less cautious in restraining their children.

For the child restraint misuse portion of the previous (1997) project, only 87 driver interviews were performed. The previous study found that although 87 interviews were adequate to determine trends, it was not sufficient to draw conclusions regarding the misuse of child restraint devices in Michigan. Therefore, 32 observation sites were selected for driver interviews in the current study. Interviewers remained at one site for eight hours or for six interviews, whichever came first.

The sites available for random selection included fast-food restaurants, child care facilities, shopping centers, and recreational facilities. For each county in each stratum, a list of all available sites was generated. Each site in a stratum was then assigned a random number and eight sites were chosen for each stratum. The day of the week selected for the survey was determined through a random process for each site as well.

The sites where the interview surveys were conducted are shown in Table 4 by stratum and by county. A total of 27 sites out of the intended 32 were utilized for the interviews. Although each location was notified ahead of the scheduled interview time, five of the sites refused to participate upon arrival of the interviewer.

Table 4. Interview Sites by Stratum

Stratum	Location
Stratum 1	
Arcadia Montessori	Bloomfield Hills
Burger King	Royal Oak
Dodge State Park	Waterford
Mayberry State Park	Northville
McDonalds	Auburn Hills
Meridian Mall	Okemos
Stratum 2	
Clinch Park Zoo	Traverse City
Children's Museum	Traverse City
Grand Haven State Park	Grand Haven
McDonalds	Grand Rapids
McDonalds	Jackson
Rivertown Shopping Center	Grandville
Sears/Target	Midland
Tanger Outlet Mall	West Branch
Stratum 3	
Appletree Children's Center	Linden
Birch Run Outlets	Birch Run
Genesee Valley Shopping Center	Flint
Grandpa Tiny's Farm	Frankenmuth
McDonalds	Flint
Sears	Muskegon
Van Buren State Park	Van Buren
Stratum 4	
A Place of Our Own	Detroit
Burger King	Dearborn
Fairlane Shopping Center	Dearborn
JC Penny	Westland
McDonalds	Detroit
Southland Shopping Center	Southfield

3.0 OBSERVER AND INTERVIEWER TRAINING

Several staff members from the WSU-TRG participated in the data collection for this project. Each of these staff members has or is pursuing an engineering degree and has been trained in general traffic data collection methods and procedures. For this project, each data collector received specific training comprised of technical assistance and field data collection. The WSU-TRG has a certified child passenger safety technician on staff that trained each interviewer for the CRD misuse portion of the project in a hands-on training course.

Each member of the data collection team participated in a reliability and repeatability study to reach a 95 percent or greater reliability and repeatability in their field data collection tests prior to being deployed for the data collection on this project. The repeatability of a measurement depends on the within-subject standard deviation, which can be calculated using a sample of closely repeated measurements. The repeatability coefficient is simply the within-subject standard deviation adjusted by a probability-based factor and is an estimate of the maximum difference likely to occur between two successive measurements on the same subjects. Reliability concerns the extent to which repeated measurements by the same method on the same subject produce the same result.

Upon completion of the training for the data collection, each member of the team received a training manual comprised of the information received during the training session, the schedule of data collection and all necessary field supplies. This training manual helped the data collection team in home study and reference prior to actual field surveys.

4.0 DATA COLLECTION

Data collection occurred in three waves, the CRD observational survey was performed during the 2005 May *Click It or Ticket* project, the CRD observational use additional surveys and the CRD misuse interviews. The CRD observational use during the 2005 May Click It or Ticket project occurred from April 24, 2005 through May 15, 2005 and again between June 6, 2005 and June 20, 2005. The additional observational surveys occurred from June 20, 2005 through July 20, 2005. The interview surveys occurred between July 21, 2005 and August 18, 2005.

For the observational surveys, the driver of each vehicle and a child under the age of four was observed for safety belt use and CRD use. In all the surveys both the driver and child were separately identified based upon their gender, estimated age and race. The vehicles were categorized into four groups: passenger vehicles, sport utility vehicles, vans or minivans and pickup trucks.

For the interview surveys, randomly selected drivers were asked to participate in a CRD study as they arrived at their destination. The driver of the vehicle was asked specific questions regarding LATCH and the use of the CRD. Then all children under the age of four in a CRD were inspected for proper fit of the CRD. The interview portion of the data collection involved a visual and hands-on inspection of the child restraint devices for children under the age of four. The inspections were conducted by members of the WSU-TRG who completed training from a certified technician who has completed NHTSA's Standardized Child Passenger Safety Technical Training Course. The data collection included gender and age of the driver, gender of the children, age of the children, and weight of the children. The vehicle types were classified in four categories: passenger vehicle, sport utility vehicle, van or minivan, and trucks. The drivers were interviewed to assess their knowledge of the Michigan child restraint device law, who installed the device, if they had received training for the installation and if so where, who placed the child in the device, how often is the device removed from the vehicle, and other related questions. The child restraint device were inspected for make, model, type, location in the vehicle, direction of placement, attachment to the vehicle, and placement of the child in the device.

5.0 DATA ANALYSIS

The data collected in the field was entered in a computer to form a database and was verified for accuracy by the project engineer and supervisor. Rates for CRD use and misuse were determined for each strata, county and statewide average. The data was also analyzed and compared with the 1997 study to assess the progress of the CRD use and misuse.

6.0 RESULTS AND CONCLUSIONS

6.1 Observational Surveys

The total number of vehicular observations was 1,560 for the observation survey.

The CRD use rate can be described by overall use rate, by stratum, by vehicle type and by various demographics. Table 5 summarizes the overall CRD use rate for the state. The belted category for the driver includes the two improperly belted categories; one belted with the shoulder belt under the arm and belted with the shoulder belt behind the back. As shown in Table 5, driver safety belt use was nearly 95 percent, while CRD use was nearly 80 percent.

Table 5. Statewide Safety Belt Use Summary

	Statewide Pre-Enforcement	
	Frequency	Percent
Driver Belt Use		
Not Belted	80	5.1%
Belted	1,480	94.9%
CRD Use		
Not in CRD	317	20.3%
Belted in CRD	1,243	79.7%

From the observed data, it seems that there is some relationship between driver safety belt use and CRD use, and the summary of the data is shown in Table 6.

Table 6. Driver Safety Belt Use and CRD Use Data

	Driver Safety Belt Use			
	Not Belted	Percent	Belted	Percent
Child Not Belted in CRD	39	2.5%	278	17.8%
Belted in CRD	41	2.5%	1,202	77.2%

Drivers who were belted were far more likely to use a CRD for child passengers (81% vs. 51%). Half of the drivers who did not buckle up placed children in CRDs, while about 20 percent of those who did buckle up did not make it a priority to use a CRD.

Other relationships between driver, vehicle characteristics, and CRD use can be examined such as how driver age, driver gender, and vehicle type impacts the use of CRDs. Table 7 summarizes such data. Drivers older than the age of 30, tend to use CRDs more often than those between the ages of 16 and 29. Drivers that are between 16 and 29 use CRDs 74.6 percent, those between 30 and 59 use CRDs at a rate of 82.4 percent, and those older than 60 use CRDs at a rate of 84.4 percent.

Table 7. Correlations in CRD Use

	Child Restrained in CRD	Percent	Child Not Restrained in CRD	Percent
Driver Age				
16-29	414	74.6%	141	25.4%
30-59	791	82.4%	169	17.6%
60+	38	84.4%	7	15.6%
Driver Gender				
Male	396	76.9%	119	23.1%
Female	847	81.1%	198	18.9%
Vehicle Type				
Passenger car	551	75.2%	182	24.8%
Sport Utility	231	86.2%	37	13.8%
Van/Minivan	414	87.9%	57	12.1%
Pick-up Truck	47	53.4	41	46.6%

In terms of gender, female drivers with children tend to use CRDs at a higher rate, 81.1 percent, than males, 76.9 percent. Vans, minivans and sport utility vehicle drivers use CRDs at a higher rate, 87.9 and 86.2 percent, respectively, than those drivers in passenger cars, 75.2 percent, and pick-up trucks, 53.4 percent.

Table 8 summarizes CRD use by strata, driver gender and age subdivided by vehicle type.

Table 8. CRD Use Summary

	All Vehicles			Passenger Cars			Sport Utility Vehicles			Vans/Minivans			Pick-up Trucks		
Statewide Distribution	Total No. of Observations	No. of Vehicles with CRD Use	Percent of Vehicles with CRD Use	No. of Vehicles Observed	No. of Vehicles with CRD Use	Percent of Vehicles with CRD Use	No. of Vehicles Observed	No. of Vehicles with CRD Use	Percent of Vehicles with CRD Use	No. of Vehicles Observed	No. of Vehicles with CRD Use	Percent of Vehicles with CRD Use	No. of Vehicles Observed	No. of Vehicles with CRD Use	Percent of Vehicles with CRD Use
Stratum 1	444	370	83.3%	191	149	78.0%	87	78	89.7%	141	130	92.2%	25	13	52.0%
Stratum 2	303	252	83.2%	127	102	80.3%	64	58	90.6%	94	83	88.3%	18	9	50.0%
Stratum 3	422	321	76.1%	206	151	73.3%	59	49	83.1%	128	107	83.6%	29	14	48.3%
Stratum 4	391	300	76.7%	209	149	71.3%	58	46	79.3%	108	94	87.0%	16	11	68.8%
Overall	1,560	1,243	79.7%	733	551	75.2%	268	231	86.2%	471	414	87.9%	88	47	53.4%
Gender Groups	Total No. of Observations	No. of Vehicles with CRD Use	Percent of Vehicles with CRD Use	No. of Vehicles Observed	No. of Vehicles with CRD Use	Percent of Vehicles with CRD Use	No. of Vehicles Observed	No. of Vehicles with CRD Use	Percent of Vehicles with CRD Use	No. of Vehicles Observed	No. of Vehicles with CRD Use	Percent of Vehicles with CRD Use	No. of Vehicles Observed	No. of Vehicles with CRD Use	Percent of Vehicles with CRD Use
Male	515	396	76.9%	225	174	77.3%	91	82	90.1%	136	114	83.8%	63	26	41.3%
Female	1,045	847	81.1%	508	377	74.2%	177	149	84.2%	335	300	89.6%	25	21	84.0%
Overall	1,560	1,243	79.7%	733	551	75.2%	268	231	86.2%	471	414	87.9%	88	47	53.4%
Age Groups	Total No. of Observations	No. of Vehicles with CRD Use	Percent of Vehicles with CRD Use	No. of Vehicles Observed	No. of Vehicles with CRD Use	Percent of Vehicles with CRD Use	No. of Vehicles Observed	No. of Vehicles with CRD Use	Percent of Vehicles with CRD Use	No. of Vehicles Observed	No. of Vehicles with CRD Use	Percent of Vehicles with CRD Use	No. of Vehicles Observed	No. of Vehicles with CRD Use	Percent of Vehicles with CRD Use
16-29	555	414	74.6%	340	246	72.4%	86	74	86.0%	87	76	87.4%	42	18	42.9%
30-59	960	791	82.4%	371	288	77.6%	178	153	86.0%	366	321	87.7%	45	29	64.4%
60+	45	38	84.4%	22	17	77.2%	4	4	100%	18	17	94.4%	1	0	0.0%
Overall	1,560	1,225	78.5%	733	551	75.2%	268	231	86.1%	471	414	87.9%	88	47	53.4%

6.2 Interview Surveys

During the observation of the various sites throughout the state, 147 interviews were conducted. Twenty-eight (28) interviews were performed in six sites for Stratum 1, 43 interviews in eight sites for Stratum 2, 44 interviews in seven sites for Stratum 3, and 32 interviews in six sites for Stratum 4. Table 9 summarizes the descriptive statistics regarding the interview surveys in terms of day of the week, time of the day, and type of site.

Additional descriptives can be used to describe the various interviews such as vehicle type, type of restraint, location of child, and age of child. Table 10 summarizes these statistics.

Based upon the restraint used and the child's age, height, and weight, it was determined that of the 123 children restrained in a CRD, 92.7 percent were using a CRD that was appropriate. Of these same children, 95.1 percent of the CRDs were facing the proper direction, either rear-facing or forward-facing. There was only one incidence of dual-system usage, safety belt and LATCH, for the installation of a CRD.

Examining the children riding in the right-front position, or the front-passenger seat, only two of the 13 children or 15.4 percent were potentially exposed to an airbag, but the children were located twelve inches or more away from the airbag.

The LATCH system was available in 57.1 percent of the vehicles and was utilized in 32.6 percent of the vehicles. Therefore, in the 24.5 percent of the vehicles had LATCH available, but the drivers opted for the safety belt CRD installation rather than using the LATCH system.

Overall, only 28.6 percent of the CRDs were installed correctly or 71.4 percent were incorrectly installed. Of the drivers utilizing the LATCH system, only 13 or 27.1 percent of the CRDs were correctly installed. This is an incorrect installation rate of 72.9 percent.

Table 9. Interview Survey Descriptive Statistics

Day of the Week	No. of Interviews Performed	Percentage of Interviews in Day of Week	No. of Sites Used	Percentage of Sites in Various Days of Week
Sunday	0	0.0%	0	0.0%
Monday	24	16.3%	5	18.6%
Tuesday	26	17.7%	4	14.8%
Wednesday	32	21.8%	6	22.2%
Thursday	36	24.5%	7	25.9%
Friday	23	15.6%	4	14.8%
Saturday	6	4.1%	1	3.7%
Total	147	100%	27	100%
Time of Day	No. of Interviews Performed	Percentage of Interviews Day/Night	No. of Sites Used	Percentage of Sites Day/Night
AM (7 AM-12 PM)	52	35.4%	10	37.0%
PM (12 PM-7 PM)	95	64.6%	17	63.0%
Total	147	100%	27	100%
Type of Site	No. of Interviews Performed	Percentage of Interviews in Various Types of Site	No. of Sites Used	Percentage of Sites in Various Types of Site
Fast-Food	34	23.1%	7	25.9%
Day Care	15	10.2%	3	11.1%
Shopping	63	42.9%	10	37.1%
Recreational	35	23.8%	7	25.9%
Total	147	100%	27	100%

Table 10. Interview Data Summary

	No. of Interviews Performed	Percentage of Interviews
Vehicle Type		
Passenger Car	55	37.4%
Sport Utility Vehicle	38	25.9%
Van/Minivan	48	32.7%
Pick-up Truck	6	4.0%
Total	147	100%
Type of Restraint		
Rear-Facing CRD	46	31.3%
Forward-Facing CRD	61	41.5%
Belt Positioning Booster	14	9.5%
Shield Booster	1	0.7%
Integrated Seat	1	0.7%
Safety Belt	24	16.3%
Total	147	100%
Location of Child		
Right Front Passenger Seat	13	8.8%
Left Center	47	32.0%
Center Center	30	20.4%
Right Center	52	35.4%
Left Back	2	1.4%
Right Back	3	2.0%
Total	147	100%
Age of Child		
Less than 1 Year	40	27.3%
1	29	19.7%
2	24	16.3%
3	25	17.0%
4	29	19.7%

The types of installation errors found with the rear-facing and forward-facing CRDs are summarized in Table 11.

Table 11. Rear and Forward-Facing CRD Installation Errors

	Correct Installation Percent	Incorrect Installation Percent
Tether was tight	47.9%	52.1%
Tether was routed correctly	50.0%	50.0%
Harness retainer clip was located at armpit level	71.4%	28.6%
Harness straps were tight	75.2%	24.8%
SB/lower anchor straps flat	81.1%	18.9%
Harness straps were in proper slots	84.4%	15.6%
CRD was at a proper angle	86.0%	14.0%
Harness straps were flat	86.7%	13.3%
Latch plate, retractor locked or locking clips were used	88.7%	11.3%
Proper belt path/lower connector path was used	92.0%	8.0%
Harness restrainer clip was fastened correctly	98.0%	2.0%
Harness was buckled	98.1%	1.9%

The belt positioning booster seat installations had a greater success rate of correct installation. The type of installation errors with the belt positioning boosters are summarized in Table 12.

Table 12. Belt Positioning Booster CRD Installation Errors

	Correct Installation Percent	Incorrect Installation Percent
Shoulder belt was properly positioned	71.4%	28.6%
Lap and shoulder belts were flat	85.7%	14.3%
Lap belt was properly positioned	92.9%	7.1%
Vehicle seat back was high enough to restrain head	92.9%	7.1%

6.3 Program Enhancements

Over the past several years, the safety belt use rate for drivers and front-seat passengers has been steadily increasing, however, the CRD use rate has only increased by approximately five percent since 1997. The misuse rate has decreased from 88.5 (1997 study) percent to 71.4 percent. The use of the LATCH system is underutilized and the use of LATCH could decrease the misuse rates. Although only 0.2 percent of children under four years old are killed or severely injured in traffic crashes per year, traffic crashes are the leading cause of deaths for such age group of children. This rate could be reduced through appropriate use of a CRD.

Parents must be provided with training at several key junctions in their child's growth. As a child ages, significant changes occur between birth and four years old. Heights and weights of children change rapidly during these years. The installation of a CRD for a newborn is drastically different than for a four year old. As doctors and hospitals have regular visits with parents, training sessions can be incorporated into sessions involving the parent and doctor reviewing the CRD used and child position. Other avenues for CRD training can be provided at day care facilities prior to drop-off of child or upon pick-up.

Introduced in 1999, the LATCH system has been installed in all vehicles assembled after September of 2002. Nearly 25 percent of the drivers that had LATCH did not utilize the system. Automobile dealers can provide group training to vehicle owners on the use of the LATCH system. In addition, pamphlets can be provided for parents as the majority of them are not utilizing their vehicle owner's manual for CRD installation information.